

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of

HAVERINEN

Group Art Unit: Unassigned

Appln. No.: Unassigned

Examiner: Unassigned

Filed: Herewith

TITLE: LOAD BALANCING IN TELECOMMUNICATIONS  
SYSTEM SUPPORTING MOBILE IP

\* \* \* \* \*

March 13, 2001

**PRELIMINARY AMENDMENT**

Hon. Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

Sir:

Prior to Examination, please amend the above-identified application as follows.

**IN THE CLAIMS:**

Please enter the following amended claims:

1. (Amended) A method for balancing load in a telecommunications system supporting Mobile IP, the system including at least one primary home agent configured to support mobility of at least one mobile node, the method comprising:

adding one or more secondary home agents to the telecommunications system, in addition to the at least one primary home agent; and

transmitting packets destined for the at least one mobile node when needed via one or more secondary home agents.

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2. (Amended) The method of claim 1, further comprising:

processing, in the primary home agent, registration requests, sent from the at least one mobile node or a foreign agent serving the mobile node in a visited network;

sending a routing request to the one or more secondary home agents to transmit packets destined for the at least one mobile node in response to receiving a registration request that is acceptable from the mobile node or from the foreign agent serving the mobile node in the visited network; and

intercepting and tunneling the packets destined for the at least one mobile node by the one or more secondary home agents in response to the routing request.

3. (Amended) The method of claim 1 further comprising:

updating Address Resolution Protocol and tunneling configurations of the one or more secondary home agents supporting IPv4 protocol, or neighbor discovery configurations and tunneling configurations of the one or more secondary home agents supporting IPv6 protocol, and

intercepting and tunneling the packets destined for the at least one mobile node using the updated Address Resolution Protocol and tunneling configurations or the neighbor discovery and tunneling configurations.

4. (Amended) The method of claim 1, further comprising:

collecting loading information by monitoring a number of packets transmitted by the primary home agent; and

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transmitting packets destined for the at least one mobile node via the one or more secondary home agents to balance the load in response to a number of transmitted packets being transmitted by the primary home agent exceeding a predetermined threshold value.

5. (Amended) The method of claim 1, further comprising:

using the primary home agent's Internet Protocol address as a source address of packets transmitted from the one or more secondary home agents and the mobile node's care-of address as a destination address.

6. (Amended) The method of claim 1, further comprising:

transmitting packets destined for the at least one mobile node via the primary home agent in response to receiving an acceptable registration request from the at least one mobile node or a foreign agent serving the mobile node in the visited network;

sending a routing request to the one or more secondary home agents to transmit the packets destined for the at least one mobile node;

intercepting and tunneling the packets destined for the at least one mobile node using the one or more secondary home agents in response to the routing request; and

stopping packet transmission to the at least one mobile node via the primary home agent.

7. (Amended) The method of claim 1, further comprising:

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sending a stop forwarding request to the one or more secondary home agents if a mobility binding to the at least one mobile node is released or a registration lifetime of the mobile node expires; and

stopping the packet transmission to the at least one mobile station via the one or more secondary home agents in response to the stop forwarding request.

8. (Amended) The method of claim 1, further comprising:

sending information indicating a duration of packet transmission to the one or more secondary home agents, and

stopping the packet transmission to the at least one mobile node via the secondary home agents if a duration indicated in the sent information expires.

9. (Amended) A telecommunications system comprising:

at least one primary home agent configured to support mobility of one or more mobile nodes; and

at least one secondary home agent, in addition to the primary home agent,

wherein the telecommunications system is configured to transmit packets destined for the at least one mobile node via the at least one secondary home agent when needed.

10. (Amended) The telecommunications system of claim 9, wherein the primary home agent is configured to process registration requests sent from the at least one mobile node or a foreign agent serving the mobile node in a visited network, and the primary home

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agent is configured to send a routing request to the at least one secondary home agent to transmit packets destined for the at least one mobile node in response to receiving a registration request that is acceptable from the mobile node or the foreign agent serving the mobile node in the visited network, and wherein the at least one secondary home agent is configured to intercept and tunnel packets destined for the at least one mobile node in response to the routing request.

11. (Amended) The telecommunications system of claim 10, wherein the at least one secondary home agent supports IPv4 protocol and is configured to update its Address Resolution Protocol and tunneling configurations, or the at least one secondary home agent supports IPv6 protocol and is configured to update its neighbor discovery configurations and tunneling configurations in response to the routing request, and at least one secondary home agent is arranged to intercept and tunnel the packets destined for the at least one mobile node using the updated Address Resolution Protocol and tunneling configurations or the neighbor discovery and tunneling configurations.

12. (Amended) The telecommunications system of claim 9, wherein the primary home agent is configured to collect loading information by monitoring number of packets it transmitted, and the telecommunications system is configured to balance a load by transmitting the packets destined for the at least one mobile node via at least one secondary home agent in response to the number of transmitted packets transmitted by the primary home agent exceeding a predetermined threshold value.

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13. (Amended) The telecommunications system of claim 9, wherein the primary home agent is configured to send a stop forwarding request to the at least one secondary home agent if a mobility binding with the at least one mobile node is released or a registration lifetime of the mobile node expires, and the at least one secondary home agent is configured to stop the packet transmission to the at least one mobile node in response to the stop forwarding request.

See the attached Appendix for the changes made to effect the above claim(s).

**IN THE ABSTRACT OF THE DISCLOSURE:**

Please delete the present Abstract of the Disclosure and replace it with the following new Abstract of the Disclosure.

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**ABSTRACT**

A method for load balancing in a telecommunications system supporting Mobile IP, the system including at least one mobile node and at least one home agent. The home agent mainly supporting the mobility of the mobile node is defined as the primary home agent and one or more secondary home agents are added to the telecommunications system. Packets destined for the mobile node are transmitted, when needed, via one or more secondary home agents.

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**REMARKS**

Claims 1-13 remain pending in the present application. By this Amendment, claims 1-13 are amended to merely clarify the recited subject matter and the Abstract is corrected to more fully conform with requirements of the regulations. Applicant submits that the foregoing changes do not introduce new subject matter into the application because all amendments are fully supported by the originally filed specification and claims.

Applicants further submit that the application and amended claims are in condition for allowance and a notice to that effect is respectfully solicited. Should the Examiner have any questions or comments, the Examiner is cordially invited to telephone the undersigned attorney at the number below, so that the present application can receive a prompt action on the merits.

Respectfully submitted,

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Enclosure: Appendix



APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

1. (Amended) A method for balancing load in a telecommunications system supporting Mobile IP, [said] the system [comprising] including at least one primary home agent [for supporting] configured to support [the] mobility of at least one mobile node, [characterized by] the method comprising [the steps of]:

adding one or more secondary home agents to the telecommunications system<sub>2</sub> in addition to the at least one primary home agent [supporting said at least one mobile node,]<sub>2</sub> and

transmitting packets destined for [said] the at least one mobile node when needed via one or more secondary home agents.

2. (Amended) [A] The method [as claimed in] of claim 1, [characterized by] further comprising[ the steps of]:

processing<sub>2</sub> in the primary home agent<sub>2</sub> [the messages, such as the] registration requests, sent from [said] the at least one mobile node or a foreign agent serving the mobile node in a visited network[,]<sub>2</sub>

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sending a routing request to [a] the one or more secondary home [agent] agents [for transmitting the] to transmit packets destined for [said] the at least one mobile node in response to receiving a registration request that is acceptable from the mobile node or from the foreign agent serving the mobile node in the visited network[.]; and

intercepting and tunneling the packets destined for [said] the at least one mobile node by the one or more secondary home [agent] agents in response to the routing request.

3. (Amended) [A] The method [as claimed in] of claim 1 [or 2, characterized by] further comprising: [the steps of]

updating [ARP] Address Resolution Protocol and tunneling configurations of the one or more secondary home [agent] agents supporting IPv4 protocol, or [neighbour] neighbor discovery configurations and tunneling configurations of the one or more secondary home [agent] agents supporting IPv6 protocol, and

intercepting and tunneling the packets destined for [said] the at least one mobile node [by means of] using the updated [ARP] Address Resolution Protocol and tunneling configurations or the [neighbour] neighbor discovery and tunneling configurations.

4. (Amended) [A] The method [as claimed in any one of the preceding claims, characterized by] of claim 1, further comprising: [the steps of]

collecting loading information by monitoring [the] a number of packets transmitted by the primary home agent[.]; and

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transmitting packets destined for [said] the at least one mobile node via the one or more secondary home agents [for balancing] to balance the load in response to [the] a number of transmitted packets being transmitted by the primary home agent exceeding a predetermined threshold value.

5. (Amended) [A] The method of [as claimed in any one of the preceding claims, characterized by] claim 1, further comprising:

using the primary home agent's [IP] Internet Protocol address as [the] a source address of packets transmitted from the one or more secondary home [agent] agents and the mobile node's care-of address as [the] a destination address.

6. (Amended) [A] The method [as claimed in any one of the preceding claims characterized by] of claim 1, further comprising: [the steps of]

transmitting packets destined for [said] the at least one mobile node via the primary home agent in response to receiving an acceptable registration request from [said] the at least one mobile node or [the] a foreign agent serving the mobile node in the visited network[.];

sending a routing request to the one or more secondary home [agent for transmitting] agents to transmit the packets destined for [said] the at least one mobile node[.];

intercepting and tunneling the packets destined for [said] the at least one mobile node [by] using the one or more secondary home [agent] agents in response to the routing request[.]; and

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stopping packet transmission to [said] the at least one mobile node via the primary home agent.

7. (Amended) [A] The method [as claimed in any one of the preceding claims, characterized by] of claim 1, further comprising: [the steps of]

sending a stop forwarding request to the one or more secondary home agents [agent in response to the fact that] if [the] a mobility binding to [said] the at least one mobile node is released or [the] a registration lifetime of the mobile node expires[.]; and

stopping the packet transmission to [said] the at least one mobile station via the one or more secondary home [agent] agents in response to the stop forwarding request.

8. (Amended) [A] The method [as claimed in any one of the preceding claims, characterized by] of claim 1, further comprising: [the steps of]

sending information indicating a [on the] duration of packet transmission to the one or more secondary home [agent] agents, and

stopping the packet transmission to [said] the at least one mobile node via the secondary home agents [agent in response to the fact that the time] if a duration indicated in the sent information expires.

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9. (Amended) A telecommunications system comprising:

at least one primary home agent [for supporting the] configured to support mobility of one or more mobile nodes<sub>1</sub>, characterized in that the telecommunications system comprises] and

at least one secondary home agent<sub>2</sub> in addition to the primary home agent [supporting said at least one mobile node, and]<sub>2</sub>

wherein the telecommunications system is [arranged] configured to transmit packets destined for [said] the at least one mobile node via the at least one secondary home agent when needed.

10. (Amended) [A] The telecommunications system [as claimed in] of claim 9, wherein [characterized in that said] the primary home agent is [arranged] configured to process [messages, such as] registration requests[, sent from [said] the at least one mobile node or a foreign agent serving the mobile node in a visited network, and the [said] primary home agent is [arranged] configured to send a routing request to the at least one secondary home agent [for transmitting] to transmit packets destined for [said] the at least one mobile node in response to receiving a registration request that is acceptable from the mobile node or the foreign agent serving the mobile node in the visited network, and wherein the at least one secondary home agent is [arranged] configured to intercept and tunnel [the] packets destined for [said] the at least one mobile node in response to the routing request.

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to send a stop forwarding request to the at least one secondary home agent [in response to the fact that] if [the] a mobility binding with [said] the at least one mobile node is released or [the] a registration lifetime of the mobile node expires, and the at least one secondary home agent is [arranged] configured to stop the packet transmission to [said] the at least one mobile node in response to the stop forwarding request.

**IN THE ABSTRACT:**

The abstract is changed as follows:

A method for load balancing in a telecommunications system supporting Mobile IP, the system [comprising] including at least one mobile node and at least one home agent. The home agent mainly supporting the mobility of the mobile node is defined as the primary home agent and one or more secondary home agents are added to the telecommunications system. Packets destined for the mobile node are transmitted, when needed, via one or more secondary home agents. [(Figure 2)]

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11. (Amended) [A] The telecommunications system [as claimed in] of claim 10, wherein [characterized in that] the at least one secondary home agent supports IPv4 protocol and is [arranged] configured to update its [ARP] Address Resolution Protocol and tunneling configurations, or [said] the at least one secondary home agent supports IPv6 protocol and is [arranged] configured to update its [neighbour] neighbor discovery configurations and tunneling configurations in response to the [tunneling] routing request, and at least one secondary home agent is arranged to intercept and tunnel the packets destined for [said] the at least one mobile node [by means of] using the updated [ARP] Address Resolution Protocol and tunneling configurations or the [neighbour] neighbor discovery and tunneling configurations.

12. (Amended) [A]The telecommunications system [as claimed in claims 9 to 11] of claim 9, [characterized in that said] wherein the primary home agent is [arranged] configured to collect loading information by monitoring [the] number of packets it transmitted, and the telecommunications system is configured to balance [the] a load[, the telecommunications system is arranged to transmit] by transmitting the packets destined for [said] the at least one mobile node via at least one secondary home agent in response to the number of transmitted packets transmitted by the primary home agent exceeding a predetermined threshold value.

13. (Amended) [A] The telecommunications system [as claimed in claims 9 to 12] of claim 9, [characterized in that said] wherein the primary home agent is [arranged] configured